AMENDMENTS TO THE CLAIMS

The following listing of claims,in which text to be added is underlined and text to be deleted is stricken through, will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) A method of altering the refractive index of a region of a crystal comprising focusing a pulsed laser beam at a desired position within the crystal and moving the focused beam along a path such that the focused beam lowers ~~alters~~ the average refractive index of the region of the crystal along the path.

2. (cancelled)

3. (Currently amended) A method according to claim 1 ~~or 2~~ in which the altered region of the crystal comprises a waveguide.

4. (Currently amended) A method according to claim 1~~, 2 or 3~~ comprising the steps of moving the focused beam along multiple paths to create a diffraction grating within the crystal.

5. (Currently amended) A method according to claim 1~~, 2 or 3~~ comprising the steps of moving the focused beam to create a selective reflector within the crystal.

6. (Currently amended) A method according to ~~any preceeding~~ claim 1 in which at least part of the region of altered refractive index is created remote from the surfaces of the crystal~~, prefarably at a distance of more that 10 lm~~.

7. (Original) A method according to claim 6 wherein the region is created at variable depth from the surfaces of the crystal and preferably forms a three dimensional light guiding structure within the crystal.

8. (Currently amended) A method according to ~~any preceding~~ claim 1 in which the effective refractive index of the region is altered by a predetermined amount ~~and preferably increased with respect to the effective refractive index of the adjacent material~~.

9. (Original) A method according to claim 8 in which the intensity of the light beam is modulated whilst the focused beam is moved modulating the predetermined change to the refractive index which is proportional to the intensity.

10. (Currently amended) A method according to ~~any preceding~~ claim 1 in which no laser-induced breakdown of the crystal in the path has occurred.

11. (cancelled)

12. (Currently amended) A method according to claim ~~13~~ 11 in which the laser crystal is YAG, Forsteryte, Vanadate, LiSAF, GSGG or Sapphire.

13. (Currently amended) A method of altering the refractive index of a region of a crystal comprising the steps of focusing a pulse laser beam at a desired position within the crystal and moving the focus beam along a path such that the focus beam alters the refractive index of the region of the crystal wherein the crystal on which the laser is focused is a laser crystal suitable for use in producing a laser and in which the laser crystal is doped with a metal. ~~A method according to claim 11 or 12 in which the laser crystal is doped, preferably with a metal~~.

14. (Currently amended) A method according to claim ~~12 or~~ 13 in which the laser crystal is chromium doped, Titanium doped, Tm, Er, Yb or neodymium doped.

15. (Original) A method according to claim 14 in which the laser crystal has additional co-doping.

16. (Currently amended) A method according to ~~any of claims~~ claim 11 ~~to 15~~ in which the laser crystal contains a number of point defects~~, preferably a substantial number and/or preferably vacancy defects~~.

17. (Currently amended) A method according to ~~any preceding~~ claim 13 in which multiple regions of altered refractive index are created at multiple different depths within the crystal.

18. (Currently amended) A method according to ~~any preceding~~ claim 13 wherein the light beam used is a pulsed laser.

19. (Currently amended) A method according to claim 18 wherein the pulsed laser is a femtosecond laser with a pulse duration of below 200 fs ~~and preferably around 120 fs~~.

20. (Currently amended) A method according to claim 18 ~~or 19~~ wherein the laser is operated at wavelength of between 1.35 μm ~~lm~~ and 1.57 μm ~~lm, and preferably 1.5 ɽm, and/or at a wavelength chosen to minimise linear absorption by the crystal~~.

21. (Currently amended) A method according to ~~any of claims~~ claim 18 ~~to 20~~ wherein the laser has a pulse frequency of between 0.5 And 1.5 kHz ~~and preferably around 1 kHz~~.

22. (Currently amended) A method according to ~~any of claims~~ claim 18 ~~to 21~~ wherein the laser has a pulse energy of around 0.5mJ.

23. (Currently amended) A method according to ~~any preceding~~ claim 1 in which the beam is focused by a microscope objective ~~preferably with a numerical~~

~~aperture in the range 0.2 to 0.65~~.

24. (Currently amended) A method according to ~~any preceding~~ claim 1 in which the focused beam is moved periodically along the path.

25. (Currently amended) A laser cavity at least part of which ~~and preferably all~~ is made by the method of ~~any preceding~~ claim.

26. (Currently amended) A crystal comprising an inscribed optical structure wherein the structure has a ~~different~~ lower refractive index to the rest of the crystal ~~and preferably a higher refractive index~~.

27. (Cancelled)

28. (Currently amended) A ~~laser cavity~~ device comprising a laser crystal including the crystal of claim 26 ~~or 27~~.

29. (Currently amended) A crystal according to ~~any of claims~~ claim 26 ~~to 27~~ in which the crystal is YAG, Forsteryte, Vanadate, LiSAF, GSGG or Sapphire.

30. (Currently amended) A crystal comprising an inscribed optical structure wherein the structure is a different refractive index to the rest of the crystal and

<u>wherein the crystal is doped with a metal</u> according to ~~any of claims~~ <u>claim</u> 26 ~~to 29~~ in which crystal is doped with a metal ~~and preferably Chromium, Titanium, Tm, Er, Yb or Neodymium doped~~.

31. (Currently amended) A crystal according to ~~any of claims 26 to~~ <u>claim</u> 30 in which the crystal has additional doping ~~and preferably~~ with Magnesium or Calcium.

32. (Currently amended) A crystal according to ~~any of claims~~ <u>claim</u> 26 ~~to 31~~ wherein at least part of the optical structure is remote from the surfaces of the crystal.

33. (Currently amended) A crystal according to claim 32 wherein at least part of the optical structure is at a depth of over 10 <u>μm</u> ~~lm~~ from the surface of the crystal ~~and preferably over 100 lm~~.

34. (Currently amended) A crystal according to ~~any of claims~~ <u>claim</u> 26 ~~to 33~~ wherein the optical structure is surrounded on all sides by non-inscribed crystal of uniform refractive index and forming part of the same lattice.

35. (Currently amended) A crystal according to ~~any of claims~~ <u>claim</u> 26 <u>to 34</u> wherein the optical structure is three dimensional~~/~~ <u>and</u> has a variable depth with

respect to surfaces of the crystal.

36. (Currently amended) A crystal according to ~~any of claims~~ claim 26 ~~to 35~~ wherein the optical structure comprises a waveguide.

37. (Original) A crystal according to claim 36 wherein the optical structure comprises a mulitcore waveguide having a plurality of coupled single waveguides.

38. (Original) A crystal according to claim 37 wherein the multicore waveguide is capable of operating as carrier of a common supermode.

39. (Currently amended) A crystal according to claim 37 ~~or 38~~ wherein the plurality of coupled single waveguides are each separated by less than 5 μm ~~lm and preferably separated by around 3.5 ךm~~.

40. (Currently amended) A crystal according to ~~any of claims~~ claim 26 ~~to 39~~ wherein the optical structure comprises a diffraction grating.

41. (Currently amended) A crystal according to ~~any of claims~~ claim 26 ~~to 40~~ wherein the optical structure comprises a selective reflector.

42. (Currently amended) A crystal according to ~~any of claims~~ claim 26 ~~to 41~~

wherein the optical structure comprises an optical coupler.

43. (Cancelled)

44. (Currently amended) A crystal according to ~~any of claims~~ claim 26 ~~to 43~~ wherein the material of the optical structure is part of the crystal and has not broken down.

45. (Currently amended) A crystal according to ~~any of~~ claim 26 ~~to 44~~ wherein the optical structures comprises a plurality of tunnel regions which passing above or on the side of each other inside the crystal.

46. (Currently amended) A crystal according to ~~any of claims 25 to 45~~ claim 26 having an increased quantity of defects throughout the crystal.

47. (Original) A crystal according to claim 46 wherein the defects comprise one or more of point defect such as vacancies, interstitial defects and substitutional impurity defects.

48. (Currently amended) A ~~Crystal~~ crystal according to claim 46 wherein the defects comprise dislocations.

49. (Currently amended) A ~~Crystal~~ crystal according to claim 48 wherein concentration of point defects is in the range 10^{18} - 10^{21} cm^{-3}.

50. (Currently amended) A ~~Crystal~~ crystal according to claim 48 ~~or 49~~ wherein concentration of dislocations is in the range 10^{7} - 10^{11} cm^{-2}.

51. (Currently amended) A method of producing a multicore waveguide, comprising a plurality of coupled single waveguides, in a material, comprising the steps of,

focusing a pulsed laser beam at a desired position within the material and moving the focused beam along a path such that the ~~focussed~~ focused beam ~~alters~~ lowers the average refractive index of the region of the material along the path,

and refocusing a pulsed laser beam at a second desired position within the material and moving the focused beam along a second path separated from the first path such that the ~~focussed~~ focused beam alters the refractive index of the region of the material along the second path.

52. (Original) A method according to claim 51 in which the first and second paths are separated by a substantially constant distance.

53. (Currently amended) A method according to claim 51 ~~or 52~~ wherein the

multicore waveguide is capable of operating as carrier of a common supermode.

54. (Currently amended) A method according to claim 51~~, 52 or 53~~ wherein the plurality of coupled single waveguides are each separated by less than 5 <u>μm</u> ~~lm and preferably separated by around 3.5 lm~~.

55. (Currently amended) A method according to ~~any of claims~~ <u>claim</u> 51 ~~to 54~~ wherein the step of refocusing and creating an additional altered region along an additional path is repeated 10 ~~or preferably 20~~ times to produce a multicore waveguide comprising 10 ~~or preferably 20~~ coupled single waveguides<u>.</u>

56. (Currently amended) A method according to ~~any of claims~~ <u>claim</u> 51 ~~to 55~~ wherein the material comprises a crystal.

57. (Cancelled)

58. (Currently amended) <u>A method of fabricating an optical structure in an active crystal comprising the steps of focusing a pulsed laser beam at a desired position within the crystal and moving the focused beam along a path such that the focused beam lowers the refractive index of the region of the crystal along the path.</u>~~A method according claim 1, 51 or 57 in which the average refractive index of the region is decreased.~~

59. (Original) A method according to claim 58 wherein the refractive index of the region is increased in part and decreased in other parts.

60. (Currently amended) A laser formed by an effective waveguide having a cladding of depressed refraction index where the core of unmodified material is surrounded at least in part, by a number of tracks comprising material modified in a way to mainly lower the refractive index. ~~A laser formed by a waveguide inscribed in a crystal of YAG lodged with Nd^{3+}.~~

61. (Currently amended) A laser according to claim 60, ~~and 36 or 37 and~~ the laser having feedback elements.

62. (Cancelled)

63. (New) A method according to claim 6 when the distance is more than 10 μm

64. (New) A method according to claim 8 wherein the point defects are vacancy defects.

65. (New) A method according to claim 19 wherein the pulse duration is around 120 fs.

66. (New) A method according to claim 20 wherein the wavelength is 1.5 μm.

67. (New) A method according to claim 20 wherein the wavelength is chosen to minimise linear absorption by the crystal.

68. (New) A method according to claim 23 wherein the numerical aperture is in the range of 0.2 to 0.65.

69. (New) A crystal according to claim 30 wherein the metal with which the crystal is doped is chromium titanium Tm, Er, Yb or neodymium.

70. (New) A crystal according to claim 33 wherein the structure is a depth of over 100 μm.

71. (New) A crystal according to claim 39 wherein the waveguides are separated by around 3.5 μm.

72. (New) A method according to claim 54 wherein the waveguides are separated by around 3.5 μm.